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LATE BLIGHT OF POTATO

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Epiphytotic development of late blight of potatoes (*Phytophthora infestans* D.B.) has been registered in the Far Eastern zone and here and there in the Non-Chernozem zones, as well as in Western Siberia and in the Urals. Foci of intensive affection have been observed in isolated farms of the Gomel'skaya, Vinnitskaya, Chernigovskaya and other Oblasts, as well as in the foothill zone of Northern Caucasus (Table 1).

Table 1
Development of Late Blight in Potato during the Period
of Blooming in the North-Ossetian ASSR (in percent)

Variety	Digorskiy State	Gorskiy State
	Strain-Testing Station (Registered 12/VI)	Strain-Testing Station (Registered 4/VIII)
Volzhanin	63	63
Krepysh	20	40
Mazhestik	25	43
Ostrovskiy	28	70
Lyubimets	80	15

In the Khabarovskiy Kray, particularly for the Priyelyul'skiy Early Variety (90-100%), an early outbreak of late blight was observed, while in the Primorskiy Kray its outbreak was late (Table 2). For example, on the farms of the former Nakhodkinskiy Rayon, the potato planting areas were struck 50-70% and only on August 13th it was observed that

tops of some of the early varieties were completely dead.

Table 2
Course of Development of Late Blight of Potato in the Former
Nakhodkinskiy Rayon of the Primorskiy Kray in 1964

Variety of Potato	Development		Variety of Potato	Development	
	Rate of Disease	10/VII 1/IX		Rate of Disease	10/VII 1/IX
Priyekul'skiy Early	100	100	Berlikhingen	55	94
Aur'yer	100	100	Paul: Wagner	24	100
Varmas	87	97	Pushkinskiy	10	53
Yubel'	75	100	Stolovyy 19	10	45
Vol'tman	50	65	Rubin	5	96

In April, a long-range prognosis of the development of late blight was made for 16 points of the northwestern zone. Here, they expected a depression of the disease with foci of moderate and intensive affection of the potato tops with the fungus. The prognosis was verified in the summer (Table 3). As can be seen from Table 3, average development rate of the disease for the zone was about 11% against the expected 28%. In 13 points out of the 16, the prognosis proved to be completely correct, which corresponds to 81%. The expected intensive development of the disease did not occur in Riga, Pskov and Borovichi.

The prognosis for 5-6 months within the rayons of the Latvian SSR, where there was a possibility of a depression and a moderate or intensive development of the disease in 1964, agreed quite well with the actual facts. As was expected, the most intensive affection of the plants by the fungus occurred in the western and southern regions of the Republic. A high degree of affection was observed in the Mittel'fryuye and Eksport varieties (up to 80%) at the base farm of the Ayzputskiy Station, although average development rate of the disease in this region was 26%. In the fields of the Stende Experimental Selection Station, intensive affection was observed in the varieties: Priyekyl'skiy Early (99%), Layndota (94%) and Mittel'fryuye (96%), and at the Priyekul'skaya Selection Station -- Layndota and Izstades (up to 100%), as well as Eksport (80%). Depression of the disease occurred in the northwestern regions of the Republic.

Table 3
Reliability of Long-Range Prognosis of Late Blight
of Potato in 1964

Where Registered	Potato Variety	Development Rate of Disease		Researchers
		As predicted 15/IV	Actually in August	
Vologda	Lorkh, Ber- likhingen	Depression (4)	Depression I. A. Gor- shkov	
Shuya, Ivanov- skaya Oblast	Berlikh- ingen	Depression (4)	Depression Ye. Ye. Belo- (3)	nosova
Tot'ma, Volo- govskaya Oblast	Same	Depression (14)	Depression Ya. K. Brod- skaya	
Yaroslavl'	Lorkh, Ber- likhingen	Moderate (45)	Moderate (50)	O. Ye. Mart'- yanov
Rybinsk	Lorkh	Depression (19)	Depression Z. L. Solov'- (22)	yeva
Korenevo, Mos- kovskaya Obl.	Berlikhigen, Peredovik.	Depression (14)	Depression L. L. Mestets- (0)	kaya
Petrozavodsk	Berlikhingen	Moderate (55)	Depression I. G. Dagrave (0)	
Pskov	Same	Epiphytotic	Depression N. I. Savel'- (91)	yeva
Borovichi	Same	Epiphytotic (2)	Depression A. K. Busa- (2)	yeva
Minsk	Agronomic	Depression (18)	Depression S. I. Bel'- (11)	skaya
Pikavere, Estonian SSR	Ostbote	Depression (2)	Depression O. Ye. Mart'- (10)	yanov
Tallin	Ostbote	Depression (2)	Depression E. K. Laan- (10)	est
Keyla, Estonian SSR	(Unknown)	Depression (10)	Depression Same	
Riga	Mittel'- fryuye	Epiphytotic (63)	Not estab- lished pre- cisely(55?)	E. G. Shmit

Aizpute, Latvian SSR	Mittel- fryuye	Moderate (26)	Moderate (26)	O. Ye. Mart'- yanov
Daugavpils	Mittel- fryuye	Depression (0)	Depression (14)	Same

It was not possible to establish prognoses for Lithuania and the Leningradskaya Oblast for lack of reliable data on the development of late blight for the last ten years. The reliability of the mathematical method of long-range prognosis can be raised to 98% and higher if we use faultless data for many years regarding the development of the disease taking into consideration the potato varieties, plant phenology and the strains of the parasite.

In the Gomel'skaya Oblast, potato fields were considerably affected only toward the end of the vegetative period, when humid weather with moderate temperature set in, for example, in the Kolkhoz imeni Lenin of the Buda-Koshelevskiy Rayon (6 hectares -- 84%) and Kolkhoz imeni 22nd Congress, CPSU, of the Gomel'skiy Rayon (8 hectares - 63%). In some rayons of the Vinnytskaya Oblast, the potato tops dried from late blight only during the second half of the summer, and the whole development process of the disease in individual varieties (from the first signs of the disease to the death of the plant) lasted for 2-3 weeks.

Areas of intensive affection occurred in the Yershovskiy Sovkhoz of the Saratovskaya Oblast in the Roza polevaya variety (12 hectares -- 100%) and in some other points of the Yershovskiy Rayon; it was observed that 50% of the plants of the Kur'yer variety died.

A moderate development of the disease was registered at some areas of the Forest-Steppe and Steppe zones and the zones of the Northern Volga Area, including the Brestskaya, Vitebskaya, Ternopol'skaya, Zhitoimirskaya, Ivanovskaya, Kuybyshevskaya, Kokchetovskaya, Mogilevskaya, Omskaya, Poltavskaya, Tyumenskaya, Chernovitskaya and Yaroslavskaya Oblasts. For example, in the Kolkhoz imeni Shevchenko in the Popel'nyanskiy Rayon of the Zhitoimirskaya Oblast, the Early Priyekyl'skiy variety was affected 42%. In the Po Leninskому Puti Kolkhoz of the Shuyskiy Rayon, Ivanovskaya Oblast, 24.5% of the plants were affected in an area of 7 hectares. In the Ukraina Kolkhoz of the Ternopol'skaya Oblast, 26% of the plants were affected on 79 hectares, in the Druzhba Kolkhoz of the same

Oblast -- 25% on 160 hectares and in the Mayak Kolkhoz -- 36% on 160 hectares.

A depression in the development of the disease was registered in the Bryanskaya, Vladimirskaia, Gor'kovskaya, Kargandinskaya, Kustanayskaya, Kurganskaya, Kaliningradskaya, Kemerovskaya, Lipetskaya, Leningradskaya, Moskovskaya, Novgorodskaya, Orlovskaya, Orenburgskaya, Pskovskaya, Roven'skaya, Penzenskaya, Sverdlovskaya, Smiskaya, Tul'skaya, Tomskaya, Chitinskaya and Kharkovskaya Oblasts, the Udmurt ASSR, the Karelian ASSR, the Tatar ASSR, the Kabardino-Balkarsk ASSR and the Lithuanian SSR.

Whenever a later development of late blight on the leaves was observed in some regions, the losses of the yield were comparatively insignificant. However, in many localities the weather conditions contributed to a strong affection of the bulbs. For example, in the Borshchevskiy Rayon of the Ternopol'skaya Oblast, in spite of the fact that a comparatively small amount of the fungus was observed on the leaves, it was observed in the fall that there was a considerable damage to the bulbs: in the Pervoye Mayak Kolkhoz, on 140 hectares -- 5%, in the Mayak Kolkhoz, on 160 hectares -- 5.6%, and in the Komsomolets Kolkhoz, on 60 hectares -- 7%. Later, the disease developed when the bulbs were stored: in the Bashkir ASSR and the Checheno-Ingush ASSR (up to 44%), in the Chelyabinskaya (up to 95%), Sverdlovskaya (up to 20%) and the Perm'skaya (up to 10%) Oblasts. Therefore, late blight should be controlled even when the fungus develops weakly on the tops of the plants. In some rayons, protective measures are carried out on a larger scale than usual (Table 4).

Table 4
Spraying of Potato Tops with Microdoses
of Copper Sulfate in 1964

Republic, Oblast	Area, treated fields (hectares)	Republic, Oblast	Area, treated fields (hectares)
Brestskaya Obl.	16828	Kabardino-Balkarsk ASSR	2550
Dagestan ASSR	1901	Minskaya Oblast	13542
Ivanovskaya Obl.	3775	Sverdlovskaya Obl.	2471
Kaliningradskaya Oblast	715	Pskovskaya Obl.	2522
Kuybyshevskaya Oblast	9663	Chernigovskaya Obl.	2000

The effectiveness of spraying the potato tops with Bordeaux mixture was estimated on many farms. In the Kavkaz Kolkhoz of the Zol'skiy Rayon, Kabardino-Balkarsk ASSR, where two preventive treatments were carried out, no affected plants were observed, while the Nal'chinskiy Sovkhoz had 40% of affected plants in the untreated areas, and at spots even 100%. In the Chernigovskaya Oblast, after the plants had been sprayed twice with Bordeaux mixture, the yield increase was: for the Priyekul'skiy Early variety, from 14 to 27 centners per one hectare and for the Al'ma variety -- from 8.5 to 17.3 centners per one hectare. In the Shchelkunskiy Sovkhoz of the Sverdlovskaya Oblast, the herbage was treated with micro-doses of copper (330 hectares), as a result of which the yield increased by 10 centners per hectare.

In the Volkovskiy Sovkhoz of the Leningradskaya Oblast, the potato tops were removed two weeks before harvesting in order to protect the bulbs from late blight. As a result of this, the affection of the bulbs was insignificant.

In many farms the bulbs were treated with copper sulfate. In the Kostylevskiy Sovkhoz of the Arkhangelskaya Oblast, this measure increased the yield by 31 centners per one hectare.

In the Far East, in the northwestern oblasts of the RSFSR, in Belorussia and in the Baltic Republics, many farms still have a considerable amount of infection in the bulbs. It is necessary to broaden the use of the chemical method there to control the disease. Therefore, the spraying should be done at the times established according to available methods of short-term prognosis for late blight. The possible volume of protective measures should be determined in advance using the mathematical method on locations. The method was described in a pamphlet by T. V. Pestinskiy Metodicheskiye ukazaniya po postanovke dolgesrochnogo prognoza fitofitery kartofelya (Instructions on Methods for the Organization of Long-Term Prognosis of Late Blight of Potato), published by VIZR (All-Union Research Institute of Plant Protection), Leningrad, 1963.